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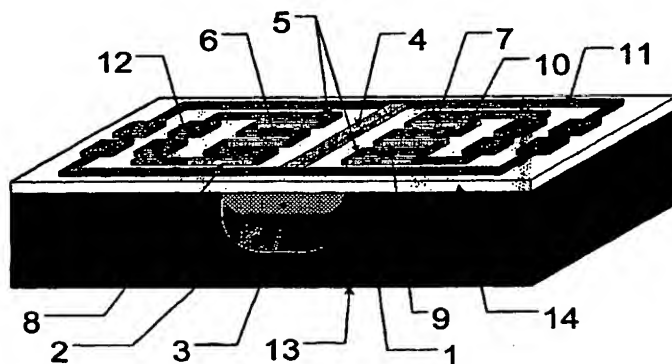
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(54) Title: "LOW POWER SILICON THERMAL SENSORS AND MICROFLUIDIC DEVICES BASED ON THE USE OF POROUS SILICON SEALED AIR CAVITY TECHNOLOGY OR MICROCHANNEL TECHNOLOGY"



(57) Abstract: This invention provides a miniaturized silicon thermal flow sensor with improved characteristics, based on the use of two series of integrated thermocouples (6, 7) on each side of a heater (4), all integrated on a porous silicon membrane (2) on top of a cavity (3). Porous silicon (2) with the cavity (3) underneath provides very good thermal isolation for the sensor elements, so as the power needed to maintain the heater (4) at a given temperature is very low. The formation process of the porous silicon membrane (2) with the cavity (3) underneath is a two-step single electrochemical process. It is based on the fact that when the anodic current is relatively low, we are in a regime of porous silicon formation, while if this current exceeds a certain value we turn into a regime of electropolishing. The process starts at low current to form porous silicon (2) and it is then turned into electropolishing conditions to form the cavity (3) underneath. Various types of thermal sensor devices, such as flow sensors, gas sensors, IR detectors, humidity sensors and thermoelectric power generators are described using the proposed methodology. Furthermore the present invention provides a method for the formation of microfluidic channels (16) using the same technique of porous silicon (17) and cavity (16) formation.

WO 03/062134 A1